Code : 011512

B.Tech. 5th Semester Exam., 2013

ENGINEERING HYDROLOGY

Time : 3 hours   Full Marks : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are **NINE** questions in this paper.

(iii) Attempt **FIVE** questions in all.

(iv) Question No. **1** is compulsory.

1. Answer any *seven* questions from the following in short, preferably *one* or *two* sentences each :   2×7=14

   (a) What is hail?

   (b) What is cyclone?

   (c) What is hyetometer?

   (d) In hydrology, what does the term 'normal' mean?

   (e) What does interception losses include?

   (f) What is hydrometry?

   (g) What is isochrone?

   (h) What is drainage density?

   (i) What is flow duration curve?

   (j) What is perched water table?

2. (a) Describe the different methods of recording of rainfall.   6

   (b) For a drainage basin of 600 km^2, isohyetal drawn for a storm gave the following data :

Isohyetal (interval) (in cm) :	15–12	12–9	9–6	6–3	3–1
Inter-isohyetal area (in km^2) :	92	128	120	175	85

   Estimate the average depth of precipitation over the catchment.   8

3. (a) Differentiate between the following :   6

   (i) Potential evapotranspiration (PET) and Actual evapotranspiration (AET)

   (ii) Infiltration capacity and Infiltration rate

   (iii) Φ-index and W-index

   (b) A class-A pan was set up adjacent to a lake. The depth of water in the pan at the beginning of a certain week was 195 mm. In that week, there was a rainfall of 45 mm and 15 mm of water was removed from the pan to keep the water level within the specified depth range. If the depth of the water in the pan at the end of the week was 190 mm, calculate the pan evaporation. Using a suitable pan coefficient, estimate the lake evaporation in that week.   8

4. (a) Explain the various commonly used methods of measurement of stage of a river. Indicate for each method its specific advantage and the conditions under which one would use it. 6

(b) The rates of rainfall for successive 30 min period of 210 min storm are

3·5, 4·0, 12·0, 8·5, 4·5, 4·5 and 3·0 cm/hr

Assuming the Φ-index of 3·5 cm/hr, find out the net rainfall in cm, the total rainfall and the value of W-index. 8

5. (a) Define hydrograph. Draw a single-peaked hydrograph and indicate its various components. 6

(b) A basin has an area of 400 km², and the following characteristics :

L = Basin length = 35 km
L_{ca} = Length up to the centroid of the basin = 10 km
Snyder's coefficients = C_t = 1·5 and C_p = 0·70

Develop synthetically the 3-h synthetic-unit hydrograph for this basin using Snyder's method. 8

6. (a) Briefly explain the Gumbel's method of frequency distribution. Write the Gumbel's equation for practical use. 6

(b) Flood frequency computations for the river Chambal at Gandhisagar dam, by using Gumbel's method, yielded the following results. Estimate the flood magnitudes in this river with a return period of 500 years : 8

Return Period T (in years) :	50	100
Peak Flood (in m³/s) :	40809	46300

7. (a) Define flood routing. Describe a commonly used method of reservoir routing.

(b) Route the following flood hydrograph through a river reach for which Muskingum coefficient K = 8 hr and x = 0·25. 8

8. (a) Distinguish between : 6

   (i) Aquifer and Aquitard

   (ii) Unconfined aquifer and Leaky aquifer

   (iii) Water table and Piezometric surface

(b) A confined aquifer is 25 m thick and 2 km wide. Two observation wells located 2 km apart in the direction of flow indicate heads of 45 m and 39·5 m. If the coefficient of permeability of the aquifer is 30 m/day, calculate—

(i) the total daily flow through the aquifer;

(ii) the piezometric head at an observation well located 300 m from the upstream well.

9. Write short notes on any *two* of the following :   14

    Hydrologic cycle

    Infiltration capacity

    Methods of base flow separation

    Snyder's method for determination of synthetic hydrograph

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